

Montana Common Core Standards for Mathematical Practice Overview Module 1M

Purpose

This guide is to aid facilitators in facilitating the process of change in local, regional and state school districts as Montana moves forward in the implementation of the Montana Common Core Standards for Mathematical Practice. Teachers are encouraged to begin with Mathematical Practice to implement the Montana Common Core. These practices can be implemented with any curriculum. They are the “habits of mind” all students need to be successful.

Time and Materials Organization

The Standards for Mathematical Practice Overview is a 90 minute session. The session can be continued or include further sessions using the Oregon Department of Education Modules referenced on Slide 17 or other quality resources. The session can be modified in length to accommodate various audiences and time allowances. The time allotted and materials used for each workshop should be chosen in collaboration with the facilitator and lead district/school personnel to best meet the needs and purpose for the intended audience.

Suggestions

- Greet the participants as they enter and visit with them.
- Make time for reflection, questions and next steps.
- Distribute the Postcard with link to documents, webinars and resources.
- Use a “Parking Lot” to write concerns that will need to be addressed later.

Facilitator Notes

The following facilitator notes are comprised of the session description, expected outcomes, agenda, time, audience, materials, introduction, and specific notes for each slide.

Session Description

Participants will explore the standards for mathematical practice to build a basic understanding of the mathematical practices and the need for continued professional development to fully implement the Standards for Mathematical Practice for all students in every classroom.



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**Montana
Office of Public Instruction**
Denise Juneau, State Superintendent

opi.mt.gov

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Participants will have the opportunity “doing math” and will reflect on their opportunities to engage in the mathematical practices.

Expected Outcomes

- Explore the Standards for Mathematical Practice
- Identify characteristics of a student and classroom that exemplifies mathematical practice.
- Plan professional development to take a closer look to
 - make sense of each mathematical practice and
 - connect practices to content for rigor and relevance.

Agenda

Introduction (Slides 1-3, approximately 10 minutes)

“Doing Math” Task (Slides 4-5, approximately 20 minutes)

Overview of Montana Common Core Standards Mathematical Practice (Slides 6-13, approximately 10 minutes)

Examination of Mathematical Practices (Slides 14-15, approximately 20 minutes)

A Closer look at Mathematical Practice Standards (Slides 16-17, approximately 15 minutes)

Reflection and Planning (10 minutes)

Time

90 minutes

Audience

Educators (teachers, administrators, leaders) working in multi- or same-grade level teams.

Materials

- Practices PowerPoint
- Common Core Appendix A “Pathways for High School”
- Montana Common Core Standards Grade-Band or complete Grade-Level Document
- Practices Handout A: Distance Time Graph, *Journey to the Bus Stop*
- Practices Handout B: Mathematical Practice Grouping Chart Complete set
- Reflection Handout C: Reflections
- Figurine for each group to “act out” Distance Time Task
- Chart paper
- Highlighters

Resources/References

Facilitators may find valuable techniques in the book: Wilkinson, Michael, [The Secrets of Facilitation: The S.M.A.R.T. Guide to Getting Results with Groups](#), San Francisco, Jossey-Bass, 2004.

Facilitators leading this session may find it helpful to view the webinar and study the Math Assignment Project (MAP) lesson prior to working with the group as it provides additional background information:



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- National Council of Supervisors of Mathematics, *Diving Deeper into the Common Core State Standards for Mathematics: Leading with the Mathematical Practices*.
<http://www.mathedleadership.org/events/webinars.html>
- The original MAP lesson materials can be found online at: Math Assessment Project (MAP)
<http://map.mathshell.org/materials/>
- Link to the Time Distance graph activity used for this session:
 - Lesson website: <http://map.mathshell.org/materials/lessons.php?taskid=208>
 - Original teacher notes: <http://map.mathshell.org/materials/download.php?fileid=667>
 - Original PowerPoint slides:
<http://map.mathshell.org/materials/download.php?fileid=668>

Pre-session Preparation

- Review the original teaching materials of the “time-distance” graph activity. The notes have been adapted from the original source materials, so the content within this activity only represents a subset of their original lesson. This session only uses the pre-assessment lesson, *Journey to the Bus Stop*, found on pages 2-3 of the MAP activity Reference Map-Time Distance Lesson document.
- Prepare materials to allow the participants to engage in telling their story using manipulatives. This could be as simple as having a figurine for each group to give the opportunity for participants to “act out” the *Journey to the Bus Stop* in their own words.

Introduction to Exploring the Standards for Mathematical Practice (10 minutes)

Slide 1: Introduction

Say, “This is an overview session that will build a basic understanding of the Mathematical Practices and the need for continued professional development in order to implement the Standards for Mathematical Practice.”

NOTE: The activities for this session can be replaced with another activity that engages and highlights different mathematical practices.

Slide 2: Expected Outcomes

Review the expected outcomes for this session.

- Explore the Standards for Mathematical Practice
- Identify characteristics of a student and classroom that exemplifies mathematical practice
- Plan professional development to take a closer look to:
 - make sense of each mathematical practice,
 - connect practices to content for rigor and relevance.

The purpose of this session is to build awareness and begin answering these questions:

- What are the Practices?
- What does a student who is using these practices look and sound like?
- What learning opportunities are students experiencing to be proficient with all Practices? (Student-Content interaction, teacher-content interaction and teacher-student interactions).
- How do these standards go hand in hand with the content standards to bring rigor and relevance to the study of mathematics?

Slide 3: Instruction

Say, “A set of common standards is important. However, the most important component is the instruction and what students are doing in the classroom. Before we look at mathematical practice, think about what a classroom looks and sounds like when all students are engaged in learning mathematics.”

Give participants a few minutes to think about the question as you go around making certain each group has markers.

Say, “Please list the words and/or phrases that you think describe such a classroom.

Individuals or one member of a group can post their words and/or phrases on the chart paper posted for all participants to see.”

Give the participants a chance to read the completed list.

Say, “Are there any words and/or phrases you would like to add? Do we agree this is a good description of a classroom of students engaged in learning mathematics? During this session we will look back at this list, make additions or changes, to create a reference for what mathematical practice might look and sound like.”



“Doing Math” Task (20 minutes)

Slide 4 Time-distance graphs

NOTE: To help participants engage in understanding the practices, they will first do a math activity and then later reflect on what opportunities they had to engage in the practice. This is the pre-assessment lesson in the MAP activity.

Say, “To better understand the standards for mathematical practices, we will first *do* a mathematics activity and then reflect on the *opportunities the activity gave for us to engage in the practices*.

This activity was adapted from the Mathematics Assessment Project (MAP), which has multiple activities to engage students in common misconceptions. These activities include handouts and teaching notes that can be used in your classroom as well.”

Slide 5 Journey to the Bus Stop (15-20 minutes)

NOTE: You may refer to the original teaching notes in the original MAP activity as you prepare for this lesson. It may be good to consider introducing models by bringing manipulatives for participants to act out their story.

Distribute Handout A: Journey to the Bus Stop and figurines.

Briefly introduce the task and help the participants to understand the problem and its context.

Say, “Read through the task and try to answer it as carefully as you can.”

It is important that participants are allowed to answer the questions without your assistance and do the best they can. They will not be scored. The purpose is to engage in the task and then examine the practices they engaged in to complete the task.

Ask participants to share their responses to the task.

Note what their work reveals about their current level of understanding and their different problem solving approaches. If time allows, summarize their difficulties as a series of questions. Some suggestions for these questions are given on page 3. of the Reference Map-Time Distance Lesson document. Select a few questions from the table that will be of help to the majority of participants.

Overview of Montana Common Core Standards Mathematical Practice (10 minutes)

Slide 6 Standards Quote

Read slide, “The Standards for Mathematical Practice describe varieties of **expertise** that mathematics educators at all levels should seek to develop in their students. These practices rest on important “**processes and proficiencies**” with longstanding importance in mathematics education. The development of the standards for mathematical practice was based on ideas from two publications: NCTM’s Principals and Standards for School Mathematics and the National Research Council’s Adding It Up.”

Slide 7 NCTM Process Standards

Say, “NCTM’s Principals and Standards for School Mathematics included a set of “process standards:” problem solving, reasoning and proof, communication, representation, and connections. Many of you may be familiar with these process standards.”

Slide 8 Adding it Up Proficiencies

Say, “The National Research Council’s Adding It Up includes five strands of Mathematical Proficiency.

Conceptual Understanding: Comprehension of mathematical concepts, operations, and relations.

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Procedural Fluency: Skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.

Strategic Competence: Ability to formulate, represent, and solve mathematical problems.

Adaptive Reasoning: Capacity for logical thought, reflection, explanation, and justification.

Productive Disposition: Habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy.”

Slide 9 Mathematical Rigor 1

Say, “The educator group that worked on the last set of math standards in 2009 wrote a Vision for Montana. That included a definition that is worth considering and applying to the mathematical practice standards as well as the content standards.”

Slide 10 Mathematical Rigor 2

Say, “What are the key words that speak to you as you read this? Does this definition relate to the processes and proficiencies; if so, how?”

(Note that they are similar or have similar wording as the NCTM process standards and *Adding it Up* proficiencies and led to the process and beliefs for Montana students.)



Slide 11 Rigor and Relevance

Say, “Just like the integration of Indian Education for All (IEFA) that relates to relevance and rigor the integration of mathematical practice also brings rigor and relevance.

Did the Distance Time Task engage you in at least two of the mathematical practice standards? This is a question we should be asking about each task we expect students to engage in completing.”

Slide 12 Standards for Mathematical Practice

Say, “Using the process standards and the five strands of mathematical proficiency, the writers of the Common Core for Mathematics developed eight Standards for Mathematical Practice.”

Read the first three words for each mathematical practice. What do you notice?”

Allow several minutes for participants to work and then **ask**, “What do you notice?”

Say, “An important note about these standards is that they are for students. They describe mathematical practices for which we want students to develop proficiency. While they have implications on teachers and their instruction, in and of themselves, they are not goals for teachers.”

Slide 13 Mathematical Practice Grouping

Distribute Handout B: Mathematical Practice Grouping Chart

Say, “Bill McCallum, one of the writers of the Common Core State Standards for Mathematics, described grouping the mathematical practices into four general categories:

Reasoning & Explaining (practice 2 & 3)

Modeling Using Tools (practice 4 & 5)

Seeing structure and generalizing (practice 7 & 8)

Say, “Read the first three words for each mathematical practice. What do you notice?”

Allow several minutes for participants to work and then ask, “What do you notice?”

Overarching habits of productive mathematical thinkers (practice 1 & 6)

What are the phrases and words you listed earlier that describe these practices: lead discussion to help clarify what these practices look and sound like in the classroom as students become proficient in all of the practices. These areas would not be expected every day; however, as often as appropriate for the tasks and as needed for students to be proficient in all practices.

Examination of Mathematical Practices (20 minutes)

Slide 14 Connections to Practices

Say, “Please read the practice standards to answer the first two questions.”

Now give participants **time to read** the practice standards and reflect on the opportunities they had as “students” to engage in the mathematical practices.

If there is time, allow participants to first discuss in small groups and then share their responses as a whole group.

Give participants the opportunity to respond to the third question and **record** any changes or additions to the list created at the beginning of the session.

A Closer look at Mathematical Practice Standards (15 minutes)

Slide 15 Practice in the Classroom

Say, “What is the difference between the traditional and the integrated problem?”

What content standard is addressed (e.g., comparing fractions)

What practices standard(s) is addressed (e.g., 1, 2, 6, 4)

Could you take a traditional problem and change to a problem that addresses both content and practice?

How? Why would you want to?”

Slide 16 Math Class Makeover

Watch and **discuss** the Dan Meyer video

(http://www.ted.com/talks/dan_meyer_math_curriculum_makeover.html)

NOTE: if you have time to extend the presentation:

A scale drawing of a very small object is larger than the object. The scale of the drawing is 2 cm: 14 mm. Find the unknown measure (in cm).

Width of object = 70 mm;

width on drawing = ?

Use Dan Meyer’s problem example.

Take a drawing and scale it for a mural.

What content standard is addressed (comparing fractions, ratios, proportion, scale drawing)?

What practices standard(s) is addressed in your problem?

Take this traditional problem and change it to a problem that addresses both content and practice?

How?

Why would you want to?



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Reflection and Planning (10 minutes)

Slide 17 Oregon Modules

Explain that the overview for this session is only an overview. For in-depth understanding for effective implementation, it is encouraged that additional professional development occur through a plan of ongoing, embedded sessions. The Oregon Department of Education is one resource that presents a closer look at the mathematical practice as well as other content in a user-friendly format. Making sense of the practices, student and teacher actions, and observation tools are addressed in these Modules.

Slide 18 Reflection and Planning

Review the list created at the beginning of the session and make changes/additions to provide a reference for what a classroom engaging students in math practice may look and sound like.

Distribute Handout C: Reflection Questions

Give participants time to complete each and follow up with participants' sharing.